

The Search for ‘Truth’: *A consumer’s guide to medical testing*

Edward M. Kloza, MS, CGC
NERGN Education Consultant

This project is supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number UH7MC30778; New England Regional Genetics Network; total award amount: 2.4 million; 100% from governmental sources. This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government

Disclosures

- Full time employee of Women & Infants Hospital of Rhode Island
- NERGN contracts with WIH for my time as genetics consultant

Objectives

- Understand the purpose of medical testing
- Distinguish between diagnostic testing and screening testing
- Identify the characteristics of a ‘good’ test
- Identify how you are protected from ‘bad’ testing
- Understand *direct-to-consumer* testing

What is the general purpose of a medical test?

- To help determine a diagnosis, plan treatment, check to see if treatment is working, or monitor the disease over time.
 - 60-70% of clinical decisions are affected by laboratory test results Clin Biochem Rev. 2017 Nov; 38(3): 107–114.

Diagnosis: A search for the truth

- Does the patient have the disorder, or do they not?

YES or NO

TEST RESULT	CONDITION
Positive	Present
Negative	Absent

Testing to determine the risk of a 'healthy' person developing symptoms of "XYZ disease" in the future

Get a diagnostic test for XYZ

TEST RESULT	XYZ DISEASE
Positive	Will get it
Negative	Won't get it

Pre-symptomatic, diagnostic test

Truth!

Expensive

Inconvenient

Risky

It's not that simple ...

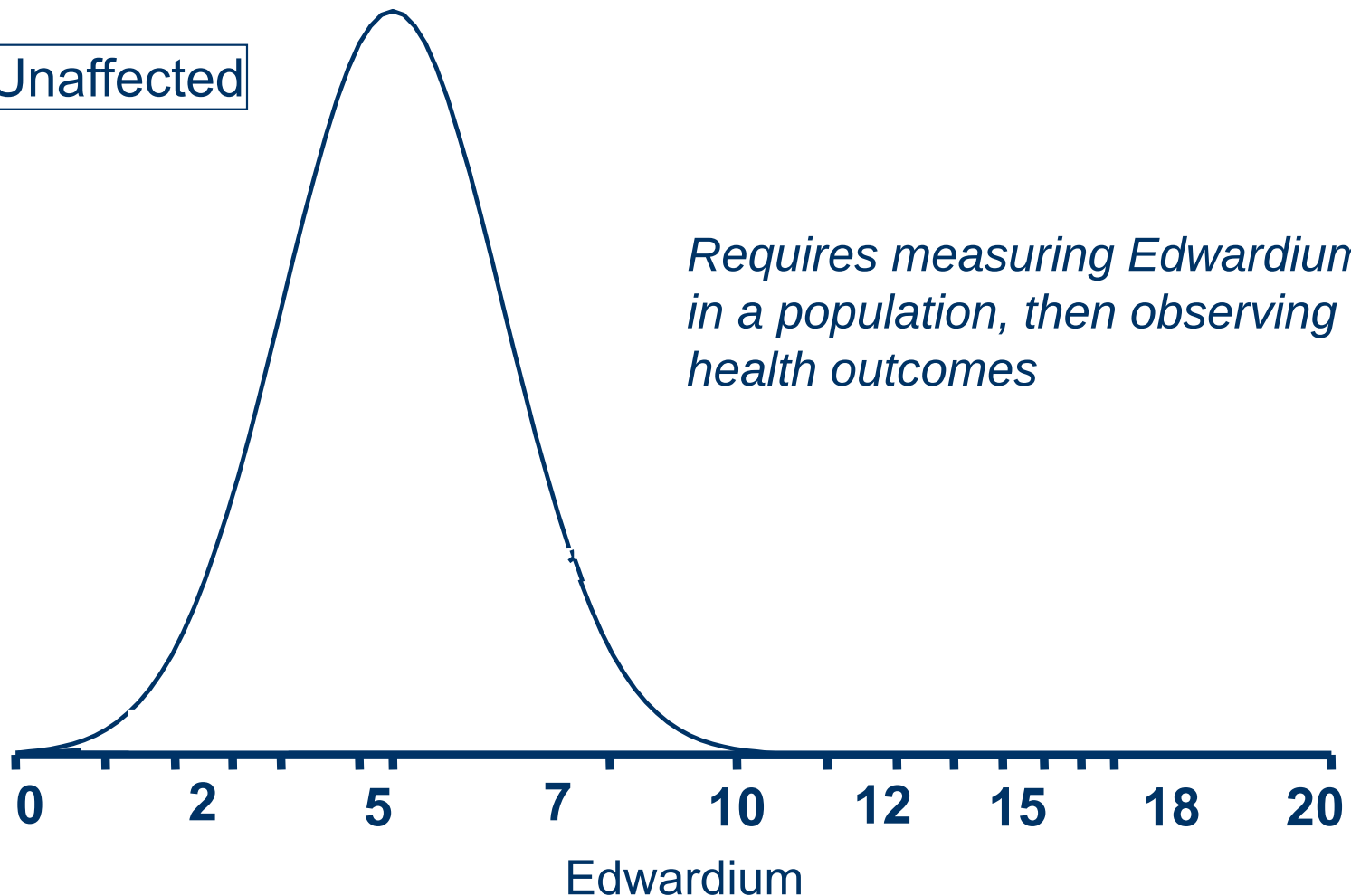


- Predicting onset of a disease before symptoms or indications occur requires measuring a marker associated with the condition.
 - Something that will show up in a test before symptoms do
- Measure the marker in a population of people
- Observe the population to see who DOES and DOESN'T develop symptoms
- Document the marker levels in each group

Who will get XYZ?

Unaffected

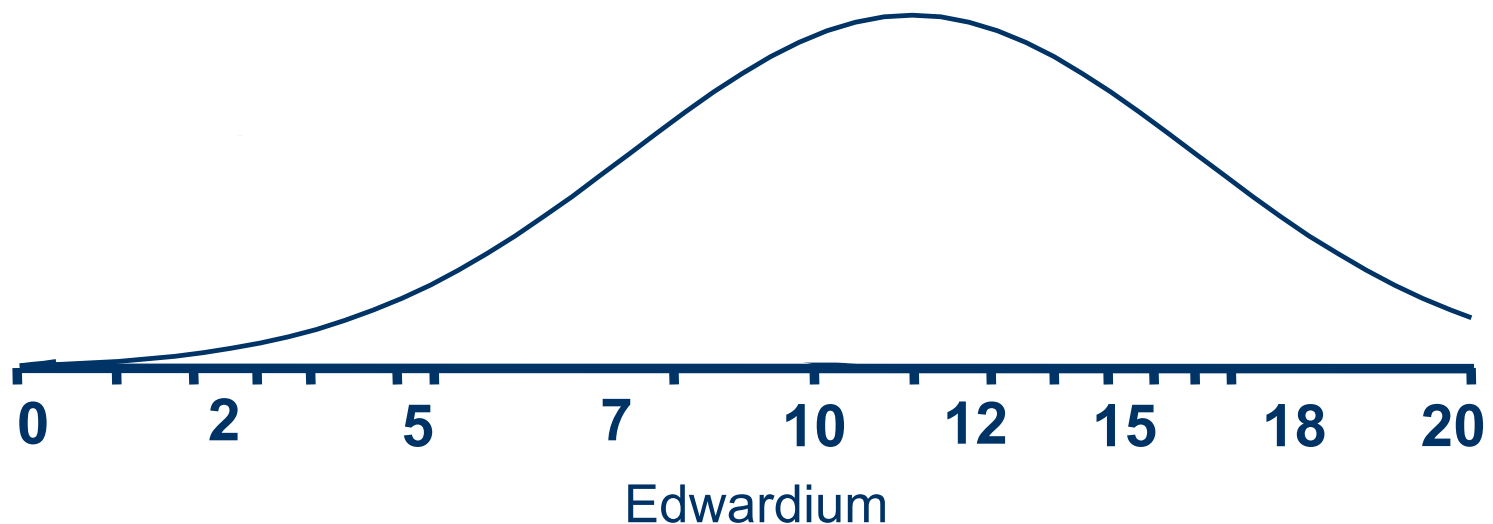
Requires measuring Edwardium in a population, then observing health outcomes



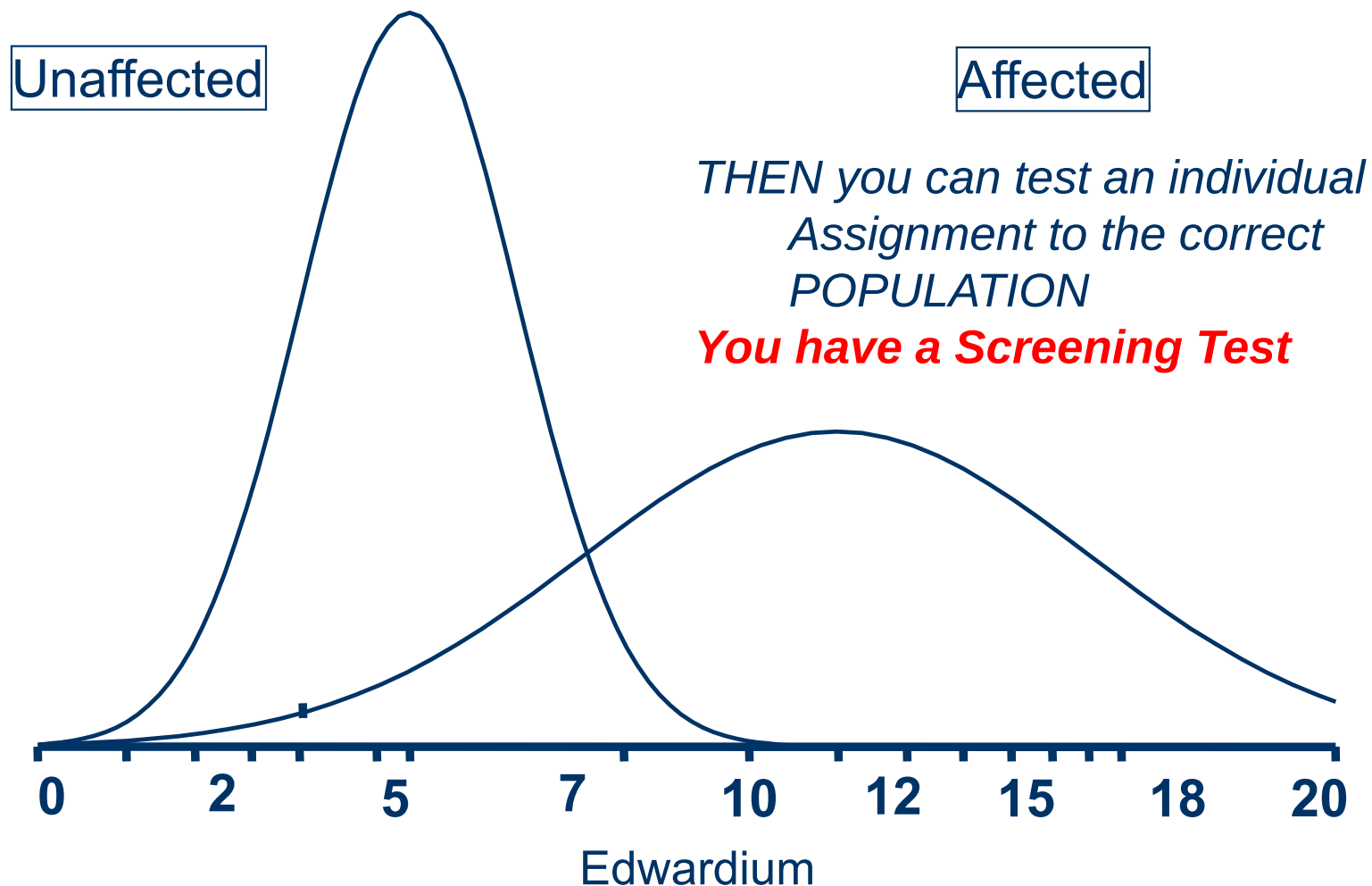
Who will get XYZ?

Affected

Requires measuring Edwardium in a population, then observing health outcomes



Who will get XYZ?



This is a “Screening” Test

- A process to identify individuals whose risk of a specific disorder warrants further investigation in order to initiate preventive action.
- Systematically offered to a population which has not sought medical attention for symptoms.
- Its purpose is to benefit the individuals being screened.

Assignment to a population assigns risk

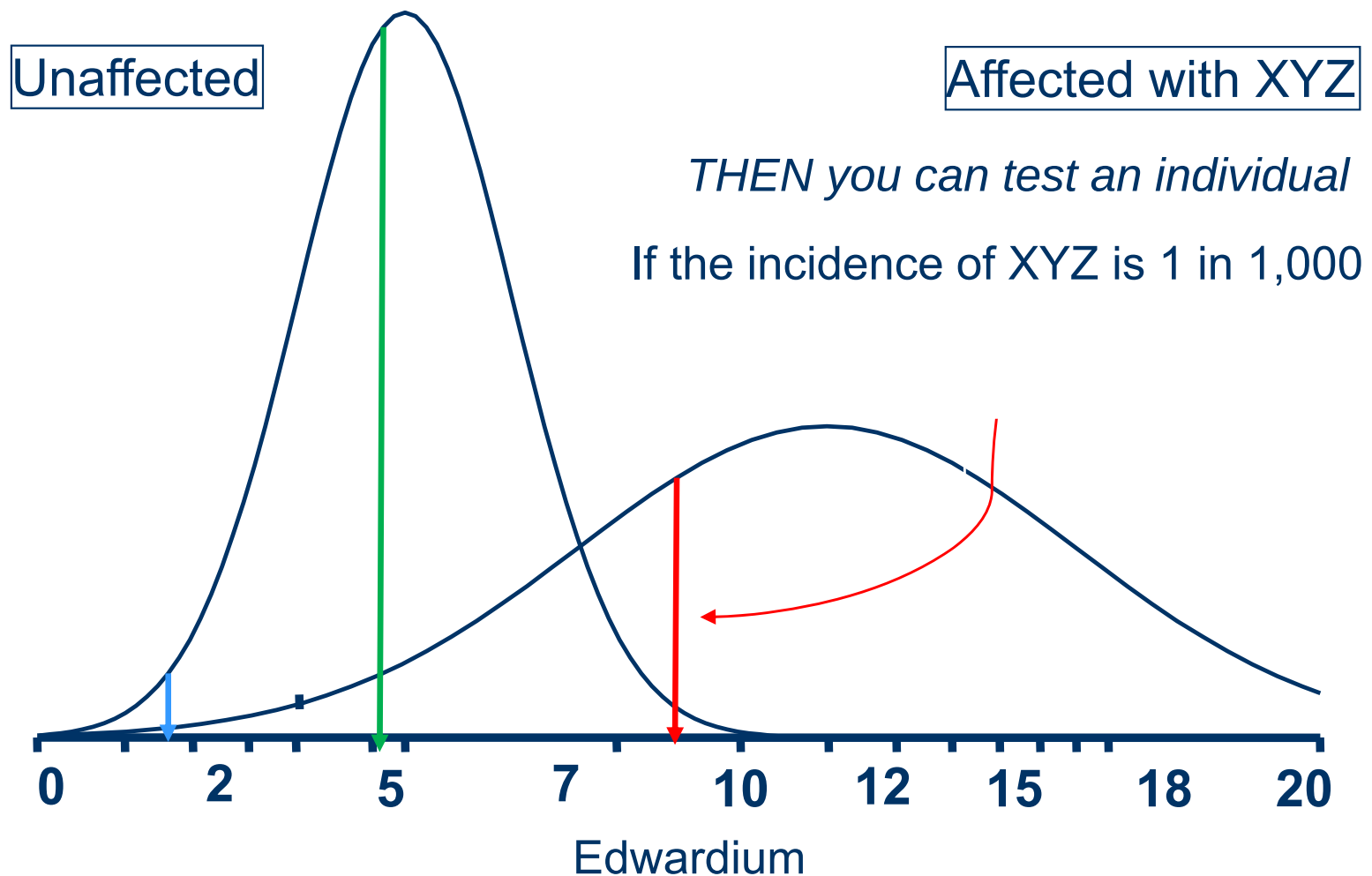
Does it tell us 'truth'?

NO! But it gets us close...

Ancient Greeks used the term **Εἶκος (eikos)**
– plausible; likeness to truth

TEST RESULT	CONDITION	
	PRESENT	ABSENT
POSITIVE	Appropriately concerned	Needlessly worried
NEGATIVE	Mistakenly reassured	Healthy

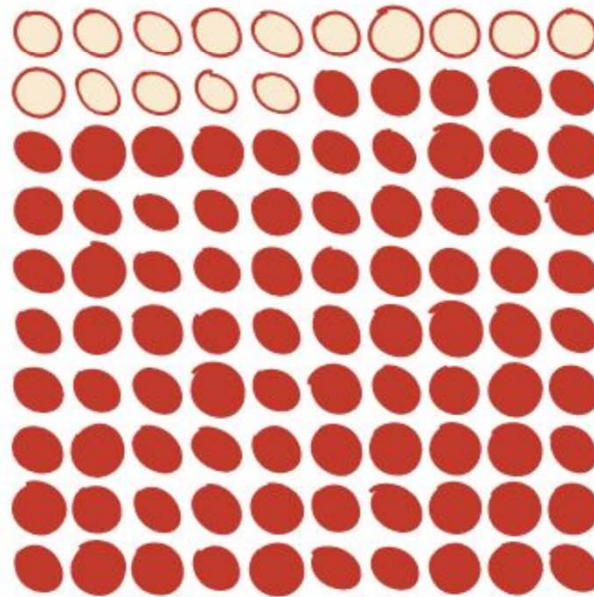
Who will get XYZ?



The New York Times

When They Warn of Rare Disorders, These Prenatal Tests Are Usually Wrong

Some of the tests look for missing snippets
of chromosomes. For every 15 times they
correctly find a problem ○ ...



... they are ● wrong **85 times**

Criteria for a Good Screening Test

- The disorder screened for should be well-defined and serious
- The prevalence in the population being tested should be known
- The testing process should be acceptable/accessibile
- A diagnostic test should be available
- Intervention should be available and acceptable

What should a good test be able to do?

- Measure what it is supposed to measure (analytic validity)
- Make sure what it's measuring will find the condition it's supposed to (clinical validity)
- Make sure finding the condition leads to treatment or improved quality of life (clinical utility)
- Address ethical, legal, social concerns

[global](#) | 19 January, 2022

An entrepreneur and a swindler

The Theranos story serves as a reminder that raising capital for a venture akin to “animating the Dead Sea” can happen only because investors – especially nontraditional ones – have become desperate in their search for positive real returns



Theranos founder Elizabeth Holmes (center) arrives to attend her fraud trial at federal court in San Jose, California, U.S. January 3, 2022. REUTERS/Brittany Hosea-Small

How can you make sure a test meets quality standards?

- You really can't ...
 - but there are plenty of organizations that can do it for you!

Federal Government

- CLIA (Clinical Laboratory Improvement Amendments)
 - Establish quality standards for all US laboratories
 - Require state certification
- CMS (Center for Medicare & Medicaid Services)
 - CLIA enforcement
 - PT (proficiency testing) programs
- FDA (Food & Drug Administration)
 - Review and approve new test
 - Determines 'complexity'
- CDC (Centers for Disease Control)
 - Analysis, research
 - Develop professional information/education

Approved Accreditation Organizations

- College of American Pathologists
- American Association for Laboratory Accreditation
- and 6 others!

BUT WAIT! THERE'S MORE!!!!

There Are the Payors

- Insurance companies can set conditions and coverage policies
 - For example, Blue Cross Blue Shield Association has a Technology Evaluation Center
 - TEC's mission is to provide healthcare decision makers with assessments that include available evidence on the diagnosis, treatment, management and prevention of disease.

Selecting the right test

ARUP Laboratories found that...

- Almost 1/3 of test orders for complex gene tests contained mistakes in handling by ordering physicians
 - Ordering wrong gene test
 - Confusing between rare genetic disorders with similar names
 - Ordering a test for a genetic mutation even though family history suggested a different gene test would be more appropriate

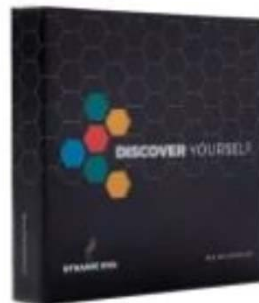
"Value of Genetic Counselors in the Laboratory." ARUP White Paper, 2012

What Does It Cost to Develop a Lab Test?

- Genetics Testing in US \$4 billion and growing
<https://www.fortunebusinessinsights.com/u-s-genetic-testing-market-105034>
 - 14 billion laboratory tests ordered annually
<https://www.cdc.gov/csels/dls/strengthening-clinical-labs.html>
 - 75,000 genetic tests on the market
 - 10 new tests each day <https://www.mygenecounsel.com/wp-content/uploads/2021/09/My-Gene-Counsel-White-Paper-Keeping-Patients-Up-to-Date-After-Genetic-Testing.pdf>
- Developing a test costs between \$20 - \$100 million
www.diaceutics.com
- Testing most profitable when widely used
 - Little incentive to test for rare diseases
 - 7,000 rare diseases: 80% genetic, 50% affect children
<https://www.pfizer.com/science/focus-areas/rare-disease>
- Marketing to those who order testing is imperative

What about direct to consumer testing?

- marketed directly to customers via television, print advertisements, or the Internet
 - \$10 billion global market by 2028
- can be bought online or in stores
- customers send the company a DNA sample and receive their results directly from a secure website or in a written report
- DTC provides people access to their genetic information without necessarily involving a healthcare provider or health insurance company in the process.



Is DTC testing accurate?

- DTC tests for non-medical, general wellness, or low risk medical purposes are not reviewed by the FDA
- DTC tests for moderate to high risk medical purposes, which may have a higher impact on medical care, are generally reviewed by the FDA
- The FDA assesses:
 - Whether a test can accurately and reliably measure what it claims to measure (analytical validity);
 - Whether the measurement is predictive of a certain state of health (clinical validity); and
 - What a company says about their test and how well it works (claims).

Get Personalized Health Recommendations Based on Your Genes & Labs

★ #1 Gene-Based Health Software.

🔒 We never sell your data.

✓ 30 day money back guarantee

GET STARTED

We support files from 23andMe, Ancestry, My Heritage, and [more!](#)

⊖ Disclaimer

SelfDecode does not and should not be used to treat, diagnose or cure any conditions, but is rather for informational and educational purposes alone. The body is very complex and you should not be making any medical decisions based on the information contained in this site and should speak to your doctor before taking any actions that pertain to your health or any condition you may have.



Nothing that we have on the site is FDA approved.

Is DTC testing safe?

According to *comparitech*, the countries with the worst protections for genetic data uploaded to DNA testing websites are (Scale 0-18):

- 1.Iran – 0/18: Iran fails to score any points due to its lack of legislation, which includes having no data protection law. This means there are no regulations surrounding the collection, use, disclosure, or retention of this sensitive data.
- 2.Iraq and the US – 1/18: Iraq and the US only manage one point because of their general laws that require judicial oversight for police access to private data (in most cases).

<https://www.comparitech.com/blog/information-security/dna-testing-privacy/>

In conclusion ...

- Medical testing is a complex, important aspect of identifying risk, making a diagnosis, and planning management
- The testing business is competitive and lucrative, and testing can be expensive
- Consumers must rely on governmental, and quasi-governmental organizations, as well as payors, i.e., insurers to oversee quality of testing and conditions for payment
- Direct to consumer testing is rapidly evolving and must be approached with caution

Thank you! Questions?